



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.: 09/819,922
Applicant(s): Roger W. Engelbart, et al.
Filed: March 28, 2001
Art Unit: 2623
Examiner: Vikkram Bali
Title: SYSTEM AND METHOD FOR IDENTIFYING
DEFECTS IN A COMPOSITE STRUCTURE

Confirmation No.: 4358

Docket No.: 038190/196421
Customer No.: 00826

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF UNDER 37 CFR § 41.37

This Appeal Brief is filed pursuant to the "Notice of Appeal to the Board of Patent Appeals and Interferences" filed November 29, 2005.

1. ***Real Party in Interest.***

The real party in interest in this appeal is The Boeing Company, the assignee of the above-referenced patent application.

2. ***Related Appeals and Interferences.***

There are no related appeals and/or interferences involving this application or its subject matter.

3. ***Status of Claims.***

The present appeal involves Claims 1-10, 12-28 and 30-41, which are presently under a final rejection as set forth by the final Official Action mailed June 1, 2005. Claims 11 and 29 have been canceled. The claims at issue are set forth in the attached Claims Appendix.

4. *Status of Amendments.*

No amendments have been filed subsequent to the final Official Action of June 1, 2005.

5. *Summary of Claimed Subject Matter.*

As shown in Figures 1-3, the system **10** for identifying defects in a composite structure **14** during fabrication of the composite structure is defined by amended independent Claims 1-19 to include a camera **12** for receiving images of the composite structure comprised of a plurality of adjacent composite strips **16**. See page 6, line 13 – page 7, line 12. The plurality of adjacent composite strips are positioned in a common direction. See page 8, lines 5 and 6 as well as Figures 4 and 5 in which the dark vertical lines represent potential gaps between adjacent strips. The system of independent Claim 1 includes a processor **20** for processing the images and outputting a response identifying a defect based on the images, while the system of independent Claim 19 recites a memory device **36** for storing the images. The system of independent Claims 1 and 19 each includes a light source **30** positioned at an oblique angle relative to the composite structure for illuminating the composite structure. See page 7, line 30 – page 8, line 11. The light source has an infrared component that is differently reflected by defects in the composite structure than from portions of the composite structure that are defect free. See page 8, line 29 – page 9, line 10. As recited by each independent claim, the light source is positioned substantially perpendicular to the common direction of the composite strips. See page 9, lines 11-23.

Similarly, the method of identifying defects in a composite structure **14** during fabrication of the composite structure that is set forth by independent Claim 35 initially positions a camera **12** proximate the composite structure, wherein the composite structure is formed from a plurality of adjacent composite strips **16** positioned in a common direction. The composite structure is illuminated with an obliquely-mounted light source **30** having an infrared component with the illumination being in a direction substantially perpendicular to the common direction of the composite strips. The camera and the light source are moved across a composite structure as images of the composite structure recorded. The images may then be processed to identify defects in the composite structure.

6. ***Grounds of Rejection to be Reviewed on Appeal.***

Claims 1-8, 10 and 14-18 stand rejected under 35 U.S.C. § 103, as being obvious over U.S. Patent No. 5,513,537 to John R. Brooks, et al. (hereinafter the “Brooks ‘537 patent”) in view of U.S. Patent No. 4,415,811 to Jurgen Beck, et al. (hereinafter the “Beck ‘811 patent”) Claim 9 was rejected as being obvious over the Brooks ‘537 patent in view of the Beck ‘811 patent and further in view of U.S. Patent No. 5,359,525 to Steven Weyenberg (hereinafter the “Weyenberg ‘525 patent”), and Claims 12 and 13 were rejected as being obvious over the Brooks ‘537 patent in view of the Beck ‘811 patent and further in view of U.S. Patent No. 6,295,129 to Svante Bjork (hereinafter the “Bjork ‘129 patent”). Additionally, to quote pages 4 and 5 of the final Official Action “Claims 19-28, 30-33 are rejected for the reasons set forth in the rejections for claims 1-10, 12-18”, “Claim 35 is rejected for the reasons set forth in the rejection of claim 1+10+17+19” and “Claims 36-41 are rejected as the reasons set forth in the rejections for claims 2-10 and 12-15”.

7. ***Argument.***

A. The Brooks ‘537 Patent and the Beck ‘811 Patent Cannot be Combined

Applicants submit that the Brooks ‘537 patent and the Beck ‘811 patent cannot properly be combined in an attempt to obviate the claimed invention as the requisite motivation or suggestion to make such a combination is lacking. In this regard, for the reasons set forth below, one skilled in the art would not have been motivated to combine the Brooks ‘537 patent and the Beck ‘811 patent except as a result of the impermissible application of hindsight. In order to properly combine references, a teaching or motivation to combine the references is essential. *In re Fine*, 837 F.2d 1071, 1075 (Fed. Cir. 1988). In fact, the Court of Appeals for the Federal Circuit has stated that “[c]ombining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor’s disclosure of a blueprint for piecing together the prior art to defeat patentability – the essence of hindsight.” *In re Dembiczak*, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). Although the evidence of a suggestion, teaching or motivation to combine the references commonly comes from the prior art references themselves, the

suggestion, teaching or motivation can come from the knowledge of one of ordinary skill in the art or the nature of the problem to be solved. *Id.* In any event, the showing must be clear and particular and “[b]road conclusory statements regarding the teaching effort of multiple references, standing alone, are not ‘evidence.’” *Id.*

As stated in MPEP § 2143.01, “the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.” MPEP § 2143.01 (citing *In re Mills*, 916 F.2d 680 (Fed. Cir. 1990)). In addition, as has been held by the Board of Patent Appeals and Interferences, and noted in the MPEP, the mere fact that one skilled in the art could adapt the reference device to meet the terms of a claim is not by itself sufficient to support a finding of obviousness. The prior art or the general knowledge of one skilled in the art must also provide a motivation or reason for one skilled in the art, without the benefit of applicant’s specification, to make the necessary modifications to the reference device. MPEP 2144.04(VI.)(C.) (citing *Ex parte Chicago Rawhide Mfg. Co.*, 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984).

In the present situation, it is submitted that there is nothing in the Brooks ‘537 patent and the Beck ‘811 patent or in the general knowledge of one skilled in the art to combine the infrared light source from the Beck ‘811 patent with the inspection system of the Brooks ‘537 patent. In this regard, the Brooks ‘537 patent is directed to a method and apparatus for determining the tack of a composite prepreg and determining if that tack is within an appropriate range so as to adhere the composite prepreg to a substrate when joined under predetermined conditions. In determining the tack, the method and apparatus of the Brooks ‘537 patent rely upon reflected light from the adhesive contact area. In contrast, the Beck ‘811 patent describes an optical scanning apparatus that relies upon light transmitted by an object under evaluation to identify defects in the object. In this regard, a properly formed object with no defects would not allow any light to pass by the object and be collected by the solar cell, while an improperly formed object and/or an object with defects would allow at least some of the light to pass by the object and be collected by the solar cell.

Accordingly, while page 3 of the first Official Action alleges that the combination of the Brooks ‘537 patent and the Beck ‘811 patent is proper since the use of an infrared light source in

an optical scanning apparatus "is conventionally done", it is submitted that such a combination is not conventional in the particular context of the Brooks '537 patent and the Beck '811 patent since the Brooks '537 patent and the Beck '811 patent are directed to techniques for solving different problems (e.g., the measurement of tack by the method and apparatus of the Brooks '537 patent and the identification of defects in an object by the optical scanning apparatus of the Beck '811 patent) and since the Brooks and Beck patents rely upon different modes of operation, that is, reflectance in the method and apparatus of the Brooks '537 patent and transmittance in the optical scanning apparatus of the Beck '811 patent. It is therefore submitted that one of ordinary skill in the art would lack the requisite motivation or suggestion to combine the references such that the rejections of Claims 1-10, 12-28 and 30-41 (all of which rely upon the combination of the Brooks '537 patent and the Beck '811 patent) are overcome.

B. The Claims are Patentably Distinct from the Cited References

Even if the references were to be combined, the system of independent Claims 1 and 19 and the method of independent Claim 35 are patentably distinct from the cited references, taken either individually or in combination, since independent Claims 1 and 19 recite that the light source is positioned substantially perpendicular to the common direction in which the plurality of adjacent composite strips are positioned and similarly since the method of independent Claim 35 recites that the composite structure is illuminated in a direction substantially perpendicular to the common direction in which the plurality of adjacent composite strips are positioned. The positioning of the light source in a direction substantially perpendicular to the common direction of the composite strips is not only counter intuitive, but has proven to be quite advantageous. In this regard, as set forth by the present application on page 9, lines 11-23:

It has been observed that the composite structure **14** produces high glare when illuminated obliquely across the direction of placement of strips **16**, while producing substantially less glare when illuminated obliquely along the direction of placement of the strips. While conventional systems sought to eliminate the glare, the systems and methods of the present invention seek to exploit the glare. In particular, the systems and methods of the present invention exploit the high-glare/low-glare phenomenon by casting oblique light across the top layer of composite strips in a direction substantially perpendicular to the direction of

placement of the strips, which produces a relatively large amount of glare on the top layer. The underlying layers, which produce significantly less glare than the top layer because of their orientation, will show through any gaps or other defects in the top layer and thus be easily located. In addition, twists and other surface defects in the top layer will alter the orientation of the strips in the top layer and thus the glare of the top layer at the defect location.

None of the cited references teach or suggest the fabrication of a composite structure from a plurality of adjacent composite strips, let alone a plurality of adjacent composite strips positioned in a common direction as recited by the independent claims. The final Official Action indicates that "Brooks further discloses the newly added limitation of [the] light source being positioned to illuminate the composite structure in a direction substantially perpendicular to the common direction of the composite strips, (see the figure 8 the light source is not illuminating directly perpendicular i.e. only substantially perpendicular) also, the plurality of adjacent composite strips are positioned in a common direction, (see col. 7, lines 51-56, for the composite strips being the common direction and the figure 8 for the light source as located substantially perpendicular [t]o the common direction)". While the Brooks '537 patent does discuss the fabrication of the composite structure, the composite prepregs are laid one upon another and are not positioned adjacent one another so as to extend in a common direction and to form a layer of the composite structure as recited by independent Claims 1, 19 and 35. In this regard, the Brooks '537 patent including that portion that immediately precedes the passage (column 7, lines 51-56) cited by the Examiner describes the strips of prepreg being cut and placed on top of one another. See column 7, lines 41-42. Thus, the strips of prepreg described by the Brooks '537 patent are not arranged adjacent to one another to form a layer as recited by independent Claims 1, 19 and 35. Instead, each strip of prepreg in the Brooks '537 patent forms a layer all by itself since the layers are laid upon one another.

Since the layers of the Brooks '537 patent are not formed of a number of adjacent strips, it is somewhat nonsensical to consider the common direction defined by the adjacent strips of prepreg that form a layer, as further defined by independent Claims 1, 19 and 35. Nonetheless, to the extent that the strips of prepreg define a common direction extending in the plane defined

between adjacent strips, the light source does not illuminate the structure in a direction that is substantially perpendicular to that common direction as asserted by the final Official Action. In this regard, the light source 224 is disposed at an angle θ to the plane defined between adjacent strips. The angle of incidence is described to be adjustable with 25° being the only example that is provided. See column 11, line 66 – column 12, line 3. In any event, the angle of incidence is not substantially perpendicular to the common direction of the composite strips as recited by independent Claims 1, 19 and 35 and, in fact, is closer to being parallel to the common direction as opposed to perpendicular. Similarly, the other cited references fail to teach or suggest a composite structure having a layer formed of a plurality of adjacent composite strips positioned in a common direction and further fail to teach or suggest a light source positioned substantially perpendicular to the common direction of the composite structure as recited by independent Claims 1, 19 and 35 and, indeed, are not cited by the final Official Action for such a teaching. Thus, any combination of the references likewise fails to teach or suggest a light source positioned substantially perpendicular to the common direction defined by a plurality of adjacent composite strips as set forth by independent Claims 1, 19 and 35.

Since the dependant claims include at least the recitations of a respective independent claim, the dependant claims are likewise not taught or suggested by the cited references for at least the foregoing reasons. However, a number of the dependant claims include additional recitations that further patentably distinguish the dependant claims from the cited references. In this regard, the final Official Action appears to impermissibly rely upon hindsight in reaching its conclusion that it would be obvious to position a camera and the light source proximate the compaction roller as recited by dependant Claims 17 and 33 and, more particularly, on the head unit as recited by dependant Claims 18 and 34 since none of the cited references teach or suggest any such positioning. In response to a challenge to the rejection of Claims 17, 18, 33 and 34 in response to the first Official Action and a request for the citation of one or more references evidencing the features set forth by these dependent claims, the final Official Action noted that “any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning” with such a reconstruction being permissible so long as it is based upon the knowledge of one of ordinary skill in the art and is not gleaned from Applicants’ disclosure.

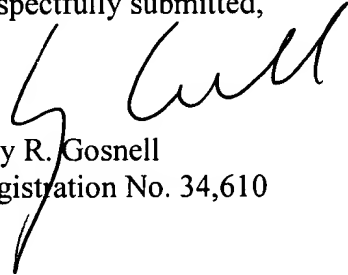
However, the final Official Action did not provide any evidence of such common knowledge even though reliance upon such common knowledge had been seasonably traversed in response to the first Official Action. As such, it is again submitted that the rejection of Claims 17, 18, 33 and 34 is inadequately supported as a result of Applicants' prior, seasonable traversal.

For each of the foregoing reasons, Applicants submit that the rejections of the claims under 35 U.S.C. § 103 are therefor overcome.

CONCLUSION

For the above reasons, it is submitted that the rejections of Claims 1-10, 12-28 and 30-41 are erroneous and reversal of the rejections is respectfully requested. A Claims Appendix containing a copy of claims involved in the appeal, an Evidence Appendix, and a Related Proceedings Appendix are attached.

Respectfully submitted,



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Claims Appendix

1. (Previously presented) A system for identifying defects in a composite structure during fabrication thereof, comprising:
 - a camera for receiving images of the composite structure comprised of a layer formed of a plurality of adjacent composite strips of material, wherein the plurality of adjacent composite strips are positioned in a common direction;
 - a processor for processing said images and outputting a response identifying a defect based on said images; and
 - a light source positioned at an oblique angle relative to the composite structure for illuminating the composite structure, said light source having an infrared component that is differently reflected by defects in the composite structure than from portions of the composite structure that are defect free, said light source being positioned to illuminate the composite structure in a direction substantially perpendicular to the common direction of the composite strips.
2. (Original) A system according to Claim 1, wherein said light source is an incandescent light with an infrared component.
3. (Original) A system according to Claim 1, wherein said camera is selected from the group consisting of a video camera and a fiber optic camera.
4. (Original) A system according to Claim 1, further comprising a filter for preventing substantially all ambient visible light from entering the camera.
5. (Original) A system according to Claim 1, wherein said light source comprises a plurality of light emitting diodes.
6. (Original) A system according to Claim 5, wherein said light emitting diodes are arranged in a cluster formation.

7. (Original) A system according to Claim 1, wherein the light source has a power output in the range of about 5W-25W.

8. (Original) A system according to Claim 1, wherein said light source includes incandescent light fiber.

9. (Original) A system according to Claim 1, wherein said light source comprises two arrays positioned such that an acute angle is defined therebetween.

10. (Original) A system according to Claim 1, wherein said oblique angle is about 45°.

Claim 11 (Canceled).

12. (Original) A system according to Claim 1, further comprising a marking device for indicating said defects on the composite structure.

13. (Original) A system according to Claim 12, wherein said marking device is an inkjet sprayer.

14. (Original) A system according to Claim 1, wherein said camera is capable of capturing images having a plurality of pixels, said images ranging from black through a plurality of shades of gray to white.

15. (Original) A system according to Claim 14, wherein said processor is capable of binarizing said images by setting all pixels representing a color darker than a predetermined gray level to one of black or white and setting all other pixels to the other of black or white.

16. (Original) A system according to Claim 15, further comprising an interface for permitting an operator to set a threshold representative of the predetermined gray level utilized by said processor to binarize the images.

17. (Original) A system according to Claim 1, wherein the composite structure comprises a plurality of composite strips, said composite strips being laid down by an automated collation process in which said composite strips are provided by a head unit and compacted to the underlying composite structure by a compaction roller, and wherein said camera and said light source are proximate the compaction roller.

18. (Original) A system according to Claim 17, wherein said camera and said light source are mounted on said head unit.

19. (Previously presented) A system for identifying defects in a composite structure during fabrication thereof, comprising:

a camera for receiving images of the composite structure comprised of a layer formed of a plurality of adjacent composite strips, wherein the plurality of adjacent composite strips are positioned in a common direction;

a memory device for storing said images; and

a light source positioned at an oblique angle relative to the composite structure for illuminating the composite structure, said light source have an infrared component that is differently reflected by defects in the composite structure than from portions of the composite structure that are defect free, said light source being positioned to illuminate the composite structure in a direction substantially perpendicular to the common direction of the composite strips.

20. (Original) A system according to Claim 19, wherein said light source is selected from the group consisting of an infrared light and an incandescent light.

21. (Original) A system according to Claim 19, wherein said camera is selected from the group consisting of a video camera and a fiber optic camera.

22. (Original) A system according to Claim 19, further comprising a filter for preventing substantially all ambient visible light from entering the camera.

23. (Original) A system according to Claim 19, wherein the camera is capable of distinguishing light from the light source and ambient visible light.

24. (Original) A system according to Claim 19, wherein said light source comprises a plurality of light emitting diodes.

25. (Original) A system according to Claim 24, wherein said light emitting diodes are arranged in a cluster formation.

26. (Original) A system according to Claim 19, wherein the light source has a power output in the range of about 5W-25W.

27. (Original) A system according to Claim 19, wherein said light source comprises two arrays positioned such that an acute angle is defined therebetween.

28. (Original) A system according to Claim 19, wherein said oblique angle is about 45°.

Claim 29 (Canceled).

30. (Original) A system according to Claim 19, further comprising a marking device for indicating said defects on the composite structure.

31. (Original) A system according to Claim 30, wherein said marking device is an inkjet sprayer.

32. (Original) A system according to Claim 19, wherein said camera is capable of capturing images by setting all pixels representing a color darker than a predetermined gray level to one of black or white and setting all other pixels to the other of black or white.

33. (Original) A system according to Claim 19, wherein the composite structure comprises a plurality of composite strips, said composite strips being laid down by an automated collation process in which said composite strips are provided by a head unit and compacted to

the underlying composite structure by a compaction roller, and wherein said camera and said light source are proximate the compaction roller.

34. (Original) A system according to Claim 33, wherein said camera and said light source are mounted on said head unit.

35. (Previously presented) A method of identifying defects in a composite structure during fabrication thereof, comprising:

positioning a camera proximate the composite structure, wherein the composite structure is comprised of a layer formed of a plurality of adjacent composite strips that are positioned in a common direction;

illuminating the composite structure with an obliquely-mounted light source having an infrared component, wherein illuminating the composite structure comprises illuminating the composite structure in a direction substantially perpendicular to the common direction of the composite strips;

moving the camera and light source across the composite structure;

recording images of the composite structure; and

processing the images to identify defects in the composite structure.

36. (Original) A method according to Claim 35, further comprising marking the defects on the composite structure.

37. (Original) A method according to Claim 35, wherein illuminating the composite structure comprises illuminating the composite structure with a light selected from the group consisting of an infrared light and an incandescent light.

38. (Original) A method according to Claim 35, wherein positioning the camera comprises positioning a fiber optic camera perpendicular to the composite structure.

39. (Original) A method according to Claim 35, wherein processing the images comprises converting the images into dichotomous representations above or below a desired threshold.

40. (Original) A method according to Claim 35, wherein illuminating the composite structure comprises illuminating the work surface with two arrays of lights.

41. (Original) A method according to Claim 35, further comprising preventing substantially all ambient visible light from entering the camera.

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Evidence Appendix

No additional evidence is provided.

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Related Proceedings Appendix

There are no related proceedings.

CLT01/4839804v1



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APPEAL BRIEF TRANSMITTAL
(PATENT APPLICATION – 37 C.F.R. § 41.37)

1. Transmitted herewith is the APPEAL BRIEF in this application, with respect to the Notice of Appeal filed on November 29, 2005.
2. ☐ Applicant claims small entity status.
3. Pursuant to 37 C.F.R. § 41.20(b)(2), the fee for filing the Appeal Brief is:
☐ small entity \$250.00
☒ other than small entity \$500.00
Appeal Brief fee due \$500.00
☒ Fee is Enclosed
☐ Please charge the fee to Deposit Account 16-0605.
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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop Appeal Brief-Patent, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on June 29, 2006.

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